We claim:

1. A method for making a device, comprising:

providing plural laminae that coupled together collectively define a monolithic device, at least one of the lamina having at least one structure, at least one substructure, and at least one fixture bridge, the structure and the substructure defining a space therebetween, and further with the substructure being coupled to the structure by the fixture bridge across the space; and

dissociating the substructure by eliminating the fixture bridge.

2. The method according to claim 1 where at least one lamina includes plural substructures and at least one substructure is coupled to at least one other substructure by a fixture bridge.

3. The method according to claim 1 whereby dissociating the substructure by eliminating at least one fixture bridge comprises applying an electrical current across the fixture bridge sufficient to eliminate the fixture bridge.

4. The method according to claim 1 whereby dissociating the substructure by eliminating the fixture bridge comprises:

heating the fixture bridge; and

selectively chemically eliminating the heated fixture bridge.

5. The method according to claim 4 whereby the fixture bridge is heated to a temperature sufficient to allow the chemical to selectively dissolve the fixture bridge.

6. The method according to claim 5 whereby a chemical is provided at a concentration, pH, and temperature sufficient to selectively dissolve at least one fixture bridge.

7. The method according to claim 4 where selectively chemically eliminating comprises using a chemical selected from the group consisting of acids, bases and oxidizing agents.

8. The method according to claim 4 whereby heating the fixture bridge comprises applying an electrical current across the fixture bridge.

9. The method according to claim 4 whereby heating the fixture bridge comprises heating lamina having the fixture bridge with a laser.

10. The method according to claim 4 whereby heating the fixture bridge comprises focusing a laser on the bridge.

11. The method according to claim 1 whereby dissociating the substructure from the structure by eliminating the fixture bridge comprises:

placing a first electrode on a first substructure to be dissociated;

contacting a structure or substructure coupled to the first substructure with a second electrode; and

applying a current through the first and second electrodes.

12. The method according to claim 11where at least one of the first and second electrodes comprises a graphite tip.

13. The method according to claim 1 further, comprising:

registering the plural laminae; and

bonding the plural laminae one to another to form a monolithic device prior to or subsequent to eliminating at least one fixture bridge.

14. The method according to claim 13 whereby the method of bonding the plural laminae one to another to form a monolithic device is diffusion bonding, diffusion soldering, thermal brazing, adhesive bonding, thermal adhesive bonding,

curative adhesive bonding, electrostatic bonding, microprojection welding, resistance welding, or combinations of these methods.

15. The method according to claim 13 further comprising:

filling the space between the structure and the substructure with a fixative prior to eliminating at least one fixture bridge; and

eliminating the fixative.

16. The method according to claim 15 where the fixative is a wax.

17. The method according to claim 15 where eliminating the fixative comprises heating the fixative.

18. The method according to claim 1 whereby making the device further comprises utilizing fabrication technologies selected from the group consisting of additive freeform fabrication, rapid prototyping, microlamination, metal microlamination, and micromechanical fabrication.

19. The method according to claim 1 whereby the manner of forming at least one lamina is selected from the group consisting of micromachining, laser photoablation, chemical micromachining, electrochemical micromachining, and through-mask electrochemical micromachining.

20. The method according to claim 1 whereby the manner of forming at least one lamina includes lamina preparation.

21. The method according to claim 20 whereby the method of lamina preparation is selected from the group consisting of chemical etching, acid etching, electropolishing, oxide-free coating, and combinations thereof.

22. The method according to claim 1 where at least one of the lamina is made from a material selected from the group consisting of metals, metal alloys, polymers, ceramics, composites, stainless steel, carbon steel or phosphor bronze, and mixtures thereof.

23. The method according to claim 1 where at least one of the lamina is made from stainless steel, carbon steel or phosphor bronze.

24. The method according to claim 1 where the device is selected from the group consisting of micromechanical systems, microelectromechanical systems, miniature energy and chemical systems, microthermal systems, microthermomechanical systems, cryocoolers, alpha-Stirling coolers, heat pumps, compressors, thermal compressors, refrigerators, heat engines, valves, nozzled valves, ink-jet print-head valves, fuel cells, fuel combustors, fuel processors, and systems comprising one or more of these devices.

25. The method according to claim 1 where the device includes at least one high-aspect-ratio microchannel having a height-to-width ratio of at least 20:1.

26. The method according to claim 1 where the device is micro-scale.

27. The method according to claim 1 where the device is meso-scale.

28. A method for making a micro- or meso-scale device comprising:

providing plural laminae that coupled together collectively define a preassembled device, at least one of the lamina having a structure and at least one substructure coupled to the structure or another substructure by at least one fixture bridge;

registering the plural laminae;

bonding the laminae one to another to form a monolithic device; and

eliminating the fixture bridge prior or subsequent to bonding the laminae.

29 30. The method according to claim 28 where the structure and substructure were formed by laser micromachining photochemical micromachining, electrochemical micromachining, or combinations of these methods.

30 31. The method according to claim 28 where bonding comprises microprojection welding.

31 32. The method according to claim 28 where bonding comprises diffusion soldering.

32 33. The method according to claim 30 where diffusion soldering comprises using layers comprising copper, silver, tin, indium and combinations and mixtures thereof.

33 34. The method where eliminating at least one fixture bridge comprises applying an electric current across the bridge.

34 35. A method for making an array of devices, comprising:

providing plural laminae where at least one of the plural lamina has an array of at least two assemblies, each assembly in the array comprising at least one structure, at least one substructure, and at least one fixture bridge, such that at least one of the structures and at least one of the substructures define a space therebetween, and at least one substructure is coupled to at least one structure by at least one fixture bridge across the space; and

dissociating at least one substructure from the structure to which it is coupled by eliminating the fixture bridge, thereby making an array of devices.

35 36. The method according to claim 34 where at least one of the assemblies includes plural substructures and at least one substructure is coupled to at least one other substructure by at least one fixture bridge.

36 ~~37~~. The method according to claim ~~35~~ 34 whereby dissociating each substructure from its coupled structure by eliminating the fixture bridge comprises applying an electrical current across the fixture bridge sufficient to eliminate the fixture bridge.

37 ~~38~~. The method according to claim ~~35~~ 34 whereby dissociating each substructure from its coupled structure by eliminating the fixture bridge comprises:

heating the fixture bridge; and

selectively chemically eliminating the fixture bridge.

38 ~~39~~. The method according to claim ~~38~~ 37 whereby at least one fixture bridge is heated to a temperature sufficient to allow the chemical to selectively dissolve the fixture bridge.

39 ~~40~~. The method according to claim ~~38~~ 37 whereby a chemical is provided at a concentration, pH, and temperature sufficient to selectively dissolve at least one of the fixture bridges.

40 ~~41~~. The method according to claim ~~40~~ 39 where the chemical is selected from the group consisting of acids, bases, oxidizing agents, and mixtures thereof.

41 ~~42~~. The method according to claim ~~38~~ 37 where heating the fixture bridge comprises applying an electrical current across the fixture bridge.

42 ~~43~~. The method according to claim ~~35~~ 34 whereby the manner of dissociating the substructures from structures by eliminating fixture bridges comprises:

placing an electrode on each substructure to be dissociated;

contacting the structure, coupled to the substructure with a second electrode; and

applying a current through the electrodes.

43 ~~44~~. The method according to claim ~~35~~ 34 further comprising:

registering the plural laminae; and

bonding the plural laminae one to another to form an array of monolithic devices.

44 ~~45~~. The method according to claim ~~44~~ 43 whereby the manner of bonding the plural laminae one to another to form an array of monolithic devices is selected from the group consisting of diffusion soldering, diffusion bonding, thermal brazing, adhesive bonding, thermal adhesive bonding, curative adhesive bonding, electrostatic bonding, microprojection welding, resistance welding, and mixtures thereof.

45 ~~46~~. The method according to claim ~~40~~ 39 whereby dissociating each substructure from the structure to which it is coupled by eliminating the fixture bridge(s) is performed after the plural laminae are registered and bonded.

46 ~~47~~. The method according to claim ~~35~~ 34 whereby dissociating each substructure from the structure to which it is coupled by eliminating the fixture bridge(s) is performed before the plural laminae are registered and bonded.

47 ~~48~~. The method according to claim ~~47~~ 46 further comprising:

filling the space between each structure and its coupled substructure with a fixative prior to eliminating the fixture bridge;

eliminating the fixture bridge; and

eliminating the fixative.

48 ~~49~~. The method according to claim ~~48~~ 47 wherein the fixative is wax.

49 ~~50~~. The method according to claim ~~48~~ 47 whereby the fixative is eliminated by heating.

50 51. The method according to claim ~~35~~ 34 whereby the manner of forming the plural laminae is selected from the group consisting of additive freeform fabrication, rapid prototyping, microlamination, metal microlamination, and micromechanical fabrication.

51 ~~52~~. The method according to claim ~~35~~ 34 whereby the manner of forming the array of structures and coupled substructures is selected from the group consisting of micromachining, laser photoablation, chemical micromachining, electrochemical micromachining, and through-mask electrochemical micromachining.

52 ~~53~~. The method according to claim ~~35~~ 34 whereby forming the array of structures and coupled substructures includes lamina preparation.

53 ~~54~~. The method according to claim ~~53~~ 52 whereby the manner of lamina preparation is selected from the group consisting of chemical etching, acid etching, electropolishing, oxide- free coating, and mixtures thereof.

54 ~~55~~. The method according to claim ~~35~~ 34 wherein at least one of the lamina is made from a material selected from the group consisting of metals, polymers, ceramics, composites, stainless steel, carbon steel, phosphor bronze, metal alloys, and mixtures thereof.

55 ~~56~~. The method according to claim ~~35~~ 34 where the device is selected from the group consisting of micromechanical systems, microelectromechanical systems, miniature energy and chemical systems, microthermal systems, microthermomechanical systems, cryocoolers, Stirling cycle cryocoolers, heat pumps, compressors, thermal compressors, refrigerators, heat engines, valves, nozzled valves, ink jet print head valves, fuel cells, fuel combustors, fuel processors, and systems comprising one or more of these devices.

56 ~~57~~. The method according to claim ~~35~~ 34 where the device includes at least one high-aspect-ratio microchannel with a ratio of height-to-width of about at least 20:1.

57 ~~58~~. The method according to claim ~~35~~ 34 where the size of the device is microscale.

58 ~~59~~. The method according to claim ~~35~~ 34 where the size of the device is meso-scale.

59 ~~60~~. A method for welding laminae, comprising:

providing at least one lamina with at least one projection, made of a material suitable for welding;

placing the laminae in contact with at least one other lamina at the site of the projection; and

applying a current through the projection sufficient to weld the laminae one to another, thereby making the device.

60 ~~61~~. The method of claim ~~60~~ 59 where the current is applied through plate electrodes.

61 ~~62~~. The method according to claim ~~60~~ 59 where the material suitable for welding is selected from the group comprising mild steel, carbon steel, low carbon steel, weldable stainless steel, gold, copper, and mixtures thereof.

62 ~~63~~. A method for bonding laminae having microstructures thereon, comprising:

providing plural laminae;

registering the laminae;

diffusion soldering the laminae one to another at a temperature and pressure that do not form soldering flash that restricts flow in or through features.

63 ~~64~~. The method according to claim ~~64~~ 63 where the pressure is from about 2 Mpa to about 5 Mpa.